

## **Title**

### **REFORMED WAFER BOAT**

## **5 Background of Invention**

### **1. Field of the Invention**

The invention relates to a wafer boat for placing the  
10 semiconductor wafers, and more particularly, to a wafer boat that  
the distances between trenches are sequentially a long one and a  
short one.

### **2. Description of the Prior Art**

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With the development of science and technology, various  
electric appliances have influenced our life profoundly. There are  
semiconductor chips in most of the electric appliances, so the  
importance of semiconductor chip industry cannot be ignored.

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In the manufacturing process of the semiconductor chips, the  
diffusion process using the furnace is one of the fundamental  
processes. In the diffusion process, wafers are firstly placed on a  
wafer boat, and then the wafer boat is placed into the furnace for

batch processing. The amount of the semiconductor chips that can be manufactured in equipment at the same time seriously affects the manufacturing cost of the semiconductor chips. If the amount of wafers in each batch process can be increased, the manufacturing  
5 cost will be effectively lowered and the throughput will be also improved.

Please refer to Fig.1. When proceeding the doping process in the furnace, some process gases have greater coefficient of  
10 viscosity and lower flowing rate, so the wafer boat 10 for placing wafers 12 needs larger intervals between trenches 14 to prevent the poor uniformity on the surface of the wafers 12 (the arrow in Fig.1 shows the upper surface of the wafer). For example, the  $\text{POCl}_3$  doping process has this kind of problem. But the larger interval  
15 between the wafers 12 makes the amount of wafers in the wafer boat fewer, and the throughput and manufacturing cost are unfavorable affected.

### **Summary of Invention**

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It is therefore a primary objective of the claimed invention to provide a reformed wafer boat that can increase the amount of wafer carried in the wafer boat while proceeding the diffusion process using gases with great coefficient of viscosity.

It is therefore another objective of the claimed invention to provide a reformed wafer boat that can improve the manufacturing throughput.

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According to the claimed invention, a reformed wafer boat is disclosed. The reformed wafer boat has a plurality of trenches, and each trench is used for placing a wafer and each trench and its adjacent trench form an interval. The plurality of intervals between the plurality of trenches are alternately composed of a first interval and a second interval, the first interval is longer than the second interval, and the wafers placed on the trenches at both ends of the second interval are in form of back to back.

15        These and other objectives of the present invention will no doubt become obvious to those of ordinary skill in the art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

## 20    **Brief Description of Drawings**

Fig.1 is a schematic diagram of a wafer boat according to the prior art.

Fig.2 is a schematic diagram of a wafer boat according to the

present invention.

Fig.3 is a schematic diagram of another wafer boat according to the present invention.

5	10	wafer boat	12	wafer
	14	trench		
	20	wafer boat	22	trench
	24	wafer		

## 10 Detailed Description

For increasing the amount of wafers placed on the wafer boat during the  $\text{POCl}_3$  doping process, the interval between the trenches and the placing direction of the wafers are reformed in the present invention. Without affecting the uniformity of the wafer, the amount of wafer placed on the wafer boat is increased.

Please refer to Fig.2, which is a schematic diagram of a reformed wafer boat 20 according to the present invention. The wafer boat 20 has a plurality of trenches 22, and each trench 22 is used for placing a wafer 24. As shown in figure, a first interval "a" is formed between each trench 22 and one adjacent trench 22, and a second interval "b" is formed between each trench 22 and the other adjacent trench 22, wherein the first interval "a" is longer than the

second interval "b". The first interval "a" and the second interval "b" are alternately formed between the trenches 22, and the wafers 24 placed on the trenches 22 at both ends of the second interval "b" are in form of back to back. The space in front of the upper surface  
5 of each wafer is at least one first interval "a". Even though the  $\text{POCl}_3$  doping process is proceeded, the uniformity of the wafer can be also kept.

Besides the first preferred embodiment, the wafer boat with  
10 little difference from the present invention is also claimed. As shown in Fig.3, the wafer boat partially utilizes the conventional design of equal intervals, but the greater part still utilizes the claimed invention sequentially using intervals a long one and a short one. The wafers placed at both ends of the smaller interval  
15 are in form of back to back. This kind of design is developed from the present invention and is also protected by the claims.

In contrast to the prior art, the present invention of the reformed wafer boat can increase the amount of wafer placed on the  
20 wafer boat without affecting the uniformity of wafers, so that the manufacturing cost can be effectively lowered and the throughput can be also improved.

Those skilled in the art will readily observe that numerous

modifications and alterations of the device may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

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